



Monitoring Priority Threatened Species

An overview of monitoring methods for the Redfin Blue-eye (*Scaturiginichthys vermeilipinnis*)

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Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

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About

This literature overview collates information on one of the 110 priority threatened species identified in the *Threatened Species Action Plan 2022-2032* and has been reviewed by invited practitioners experienced in monitoring the species.

The *Survey Guidelines for Monitoring Threatened Species* project, a collaboration of the Department of Climate Change, Energy, the Environment, and Water (DCCEEW) and the Terrestrial Ecosystem Research Network (TERN), aims to improve our knowledge of threatened species by enhancing accessibility and sharing of quality scientific threatened species data. By developing best practice field survey guidelines and recommendations, practitioners will be better equipped to conduct standardised, repeatable surveys.

By identifying the monitoring methods typically implemented by practitioners, documenting and assessing the techniques known to work, and identifying opportunities to standardise the methods, we can move towards ensuring all monitoring is species-appropriate, comparable between practitioners and populations, and repeatable over time. Further, together with consistent terminology, guidelines, instructions, and data collection, we can refine efforts and resources to measure and share information. Data collected using robust, standardised methods will improve our knowledge of threatened species and underpin threatened species recovery at scale. This project is essential to establishing monitoring protocols and data repositories to enhance the accessibility and sharing of threatened species data.

TERN has prepared the literature overviews for the Department of Climate Change, Energy, the Environment, and Water. For further information, please visit the [EMSA Threatened Species Survey Guidelines](#) website. Additional information, particularly monitoring methods and techniques not included that should be considered, can be brought to the author's attention by emailing tern@adelaide.edu.au for consideration for future updates.



Contents

1	Background.....	1
1.1	Conservation status and species trajectory.....	1
1.1.1	Current EPBC Act status.....	1
1.1.2	Summary of data held in the Threatened Species Index.....	1
1.2	Distribution.....	1
1.3	Habitat.....	1
1.4	Ecology.....	2
1.5	Threats.....	2
2	Existing monitoring methods.....	3
2.1	Summary of existing methods used.....	3
2.2	Existing survey requirements.....	3
2.3	Existing protocols.....	3
2.4	Methods to consider further.....	4
2.4.1	Available methods.....	4
2.4.2	Additional methods.....	4
2.4.3	Methods to rule out.....	4
2.4.4	Relevant Ecological Monitoring Standards Australia (EMSA) modules.....	4
2.4.5	Other 110 priority species with potential links.....	4
3	Considerations for survey guidelines development.....	5
3.1	Key documents for further review.....	5
3.2	Key agencies and organisations involved in the species research and recovery.....	5
4	References.....	6

Tables

Table 1. Survey guidelines, protocols, and key resources that identify Redfin Blue-eye monitoring methods.....	3
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1 Background

1.1 Conservation status and species trajectory

1.1.1 Current EPBC Act status

- Endangered

1.1.2 Summary of data held in the Threatened Species Index

The Threatened Species Index (TSX) provides reliable and robust measures of change in the relative abundance of Australia's threatened and near-threatened species at national, state and regional levels. Understanding these changes in species populations is crucial for monitoring Australia's conservation progress and allows users to measure and report on the benefits of conservation investments, and to justify and design targeted management responses. Currently, the index is restricted to birds, plants and mammals, with new groups to be added in the near future.

The TSX does not hold data on the Redfin Blue-eye. More information on the TSX, including how to contribute threatened species monitoring data to the index, can be found at tsx.org.au

1.2 Distribution

- The Redfin Blue-eye (*Scaturiginichthys vermeilipinnis*) has an extremely restricted distribution and is only found in the group of natural springs at Edgbaston Reserve in central western Queensland. Water for the springs comes from the Great Artesian Basin (Bush Heritage Australia 2023). Edgbaston Springs is located in upper Aramac Creek, part of the Cooper Creek/Lake Eyre drainage basin (Unmack and Wager 2007).
- Edgbaston Springs has 51 active springs, scattered across an area of approximately 50 km². Other water bodies in the catchment do not appear to support the species (Fairfax *et al.* 2007).
- The total area of all springs currently supporting Redfin Blue-eye is less than 0.5 hectares (Bush Heritage Australia 2023).
- 250-500 Captive-bred Red-finned Blue-eye fish on Edgbaston Reserve continue to breed, with the population having approximately doubled since the program's inception in 2018 with 180 fish.

1.3 Habitat

- Redfin Blue-eye has a very restricted habitat (Fairfax *et al.* 2007).
- Individual springs range from a few square metres to approximately one hectare. The spring substrate is covered by globular algae, which forms a loose layer up to 40 mm thick (Wager 1995).
- Redfin Blue-eye usually occurs in waters with temperatures warmer than 16 °C (Wager and Unmack 2004).
- When the species was first found, the water in the clay-bottomed springs was clear, 26 °C and vegetated by grass tussocks and a small red-leaved plant (Ivantsoff *et al.* 1991).
- The water temperature in November 1990 was recorded at 36 °C with a pH of 8 and, in April 1991, varied between 23-25 °C just before darkness (Unmack and Brumley 1991).
- The maximum depth of the water in the pools is 8 cm, and the pools are in full sunlight most of the day (Unmack and Brumley 1991).

- Adult Redfin Blue-eye generally occupy water depths between 1 cm and 4 cm, although they can regularly occur in water less than 1 cm deep when summer evaporation restricts habitat availability.
- Juveniles occupy shallower habitats than adults, mainly with a depth ranging between 0.5-1 cm (Wager 1995; Fairfax *et al.* 2007; DOE 2022).

1.4 Ecology

- In captive populations, the average lifespan of the Redfin Blue-eye is less than 18 months (Fairfax *et al.* 2007). The longest a Redfin Blue-eye survived in captivity was about 30 months.
- Females can breed more or less continuously between 4–15 months of age and, within that time, have at least a 4–6 week period of laying, with one to three (maximum seven) eggs per day (Tappin 1995).
- Eggs are opaque and very large for the size of the fish (about 1.5 mm diameter) with filaments that attach to vegetation or substrate (Fairfax *et al.* 2007).
- Juveniles hatch after one to two weeks, with egg-hatching rates in captivity documented to be between 44% (Tappin 1995) and a little over 60% (Robinson 2004).
- Individuals can reach half the size of adults in six to ten weeks (Fairfax *et al.* 2007).
- Both eggs and juveniles have been found throughout the year but are more common in warmer months (Wager 1995; Wager and Unmack 2004; DOE 2022).

1.5 Threats

- The primary threat is introduced Eastern Gambusia (Mosquitofish).
- Habitat degradation caused by cattle and feral pigs that trample plants, increase turbidity, and degrade water quality.
- The effect of thousands of bores drilled into the Great Artesian Basin have reduced water levels, spring flows and aquifer pressure. A number of springs have also been excavated to increase water storage, directly destroying Redfin Blue-eye habitat (Bush Heritage Australia 2023).

2 Existing monitoring methods

2.1 Summary of existing methods used

- Signs – DNA/eDNA/eRNA
- Direct observation

2.2 Existing survey requirements

- Optimal time of year/season/climate conditions (timing with resource availability etc)
 - Limited information. Sampling is probably best completed during dry periods, because of the difficulty in reaching sampling sites during wet periods (DSEWPC 2011).
- Optimal location of surveys
 - Occupied artesian springs on Edgbaston Reserve can change, especially if mosquito fish invade (Furlan *et al.* 2020).
- Minimum survey effort
 - Hours per artesian spring.
 - Days of monitoring using stereo-BRUVS (battery/storage life) (Langlois *et al.* 2020).
- Survey personnel
 - 2-4 people (would include experts)
- Other factors:
 - Accurate estimates of population size can be difficult owing to the small size of the fish and vegetation cover, and these difficulties are amplified in larger springs.
 - Redfin Blue-eye occur in schools, which break up when disturbed, also making abundance estimates difficult.
 - Redfin Blue-eye populations, since 1992, have largely been estimated based on counts of individuals in small areas multiplied by the area of habitat.
 - Despite possible discrepancies between surveyors and survey conditions, the limited habitat area, depth, cover and high visibility permit a credible relative assessment through time.
 - The entire spring complex has been monitored every year between 1992–1997, then again in 2005 and 2006 (Fairfax *et al.* 2007). Bush Heritage Australia bought the Edgbaston property (home to the entire known distribution of the species) in 2008 and have been monitoring the native and translocated population every year since (Sacre 2022).

The distinctive features that separate the Redfin Blue Eye from other Pseudomugilidae include a narrow rounded caudal fin, higher insertion of pectoral fins and frequent absence of ventral fins (Fairfax *et al.* 2007).

2.3 Existing protocols

Existing protocols identified are identified in Table 1.

Table 1. Survey guidelines, protocols, and key resources that identify Redfin Blue-eye monitoring methods

Protocol	Comments	Reference
Survey guidelines for Australia's threatened fish.	Outlines general survey methods for Queensland artesian spring fishes which includes the Redfin Blue-eye.	(DSEWPC 2011)

2.4 Methods to consider further

The methods listed below have been identified as potential methods and techniques to survey for the species, either to identify presence or absence, or to assist determining population size and status. Further review of the literature and consultation with experts is required, particularly to identify and assess specific techniques for examining population ecology factors.

2.4.1 Available methods

- Since the water the Redfin Blue-eye occupies tends to be clear, the primary survey method is direct observations (Fairfax *et al.* 2007).
- eDNA

2.4.2 Additional methods

- In very shallow water (generally < 40mm), a version of the baited (or unbaited) remote underwater stereo-video systems (stereo-BRUVS) using small-sized Go-Pros may be appropriate (Langlois *et al.* 2020).

2.4.3 Methods to rule out

- All survey methods typical for fish are considered suitable (no specific methods ruled out).
- Anything that requires water more than 8cm deep.

2.4.4 Relevant Ecological Monitoring Standards Australia (EMSA) modules

No Ecological Monitoring System Australia (EMSA) modules developed by TERN for the Australian Government have been identified for consideration in surveying the Redfin Blue-eye. EMSA protocols to date have only focussed on terrestrial ecosystems.

2.4.5 Other 110 priority species with potential links

- None have been identified to date.

3 Considerations for survey guidelines development

Key considerations should a full literature review and/or survey guidelines be developed for the Redfin Blue-eye are highlighted below.

- Special equipment required:
 - Small-sized Go-Pros if trialling a very shallow water version of the baited (or unbaited) remote underwater stereo-video systems (stereo-BRUVS) (Langlois *et al.* 2020).
- Estimated time and surveyor effort:
 - Hours per artesian spring – likely a week to survey the whole Edgbaston Reserve spring system.
- Vegetation communities or landscapes of the species' preferred habitat not suitable for the optimal survey methods:
 - None have been identified to date.

3.1 Key documents for further review

The documents listed below have been identified as key documents to review should a full literature review and/or survey guidelines be developed for the Redfin Blue-eye.

- Protocols:
 - DSEWPC (2011) Survey guidelines for Australia's threatened fish. Guidelines for detecting fish listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.
- Scientific papers and reports:
 - Fairfax, R., R. Fensham, R. Wager, S. Brooks, A. Webb & P. Unmack (2007). Recovery of the red-finned blue-eye: an endangered fish from springs of the Great Artesian Basin. *Wildlife Research* 34:156-166.
 - (Legge *et al.* 2018) Monitoring threatened species and ecological communities.

3.2 Key agencies and organisations involved in the species research and recovery

- Bush Heritage Australia, Recovery Team Chair
- Australia and New Guinea Fish Association.

4 References

- Bush Heritage Australia (2023) 'Red-finned Blue-eye.' Available at <https://www.bushheritage.org.au/species/red-finned-blue-eye> [Accessed 20 Mar 2023].
- DOE (2022) 'Scaturiginichthys vermeilipinnis in Species Profile and Threats Database.' Available at http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=56792
- DSEWPC (2011) Survey guidelines for Australia's threatened fish. Guidelines for detecting fish listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of Sustainability, Environment, Water, Population and Communities.
- Fairfax, R, Fensham, R, Wager, R, Brooks, S, Webb, A, Unmack, P (2007) Recovery of the red-finned blue-eye: an endangered fish from springs of the Great Artesian Basin. *Wildlife Research* **34**, 156-166.
- Furlan, EM, Gruber, B, Attard, CRM, Wager, RNE, Kerezszy, A, Faulks, LK, Beheregaray, LB, Unmack, PJ, Struebig, M (2020) Assessing the benefits and risks of translocations in depauperate species: A theoretical framework with an empirical validation. *Journal of Applied Ecology* **57**, 831-841.
- Ivantsoff, W, Unmack, P, Saeed, B, Crowley, LELM (1991) A red-finned blue-eye, a new species and genus of the family Pseudomugilidae from central western Queensland. *Fishes of Sahul. Journal of the Australia New Guinea Fishes Association* **6**, 277-282.
- Langlois, T, Goetze, J, Bond, T, Monk, J, Abesamis, RA, Asher, J, Barrett, N, Bernard, ATF, Bouchet, PJ, Birt, MJ (2020) A field and video annotation guide for baited remote underwater stereo-video surveys of demersal fish assemblages. *Methods in Ecology and Evolution* **11**, 1401-1409.
- Legge, S, Robinson, N, Lindenmayer, D, Scheele, B, Southwell, D, Wintle, B (2018) 'Monitoring threatened species and ecological communities.' (CSIRO Publishing: Clayton South, Viclin)
- Robinson, R (2004) *Scaturiginichthys vermeilipinnis* - propagating by egg picking. *Australia and New Guinea Fish Association News* **20**, 3.
- Sacre, W (2022) 'A leap of progress for the Red-finned Blue-eye.' Available at <https://www.bushheritage.org.au/blog/red-fin-blue-eye-progress> [Accessed 09/10/2023].
- Tappin, A (1995) Redfined Blue Eye. *Fishes of Sahul. Journal of the Australia New Guinea Fishes Association* **9**, 430-432.
- Unmack, PJ, Brumley, C (1991) Initial observations on spawning and conservation status of redfined blue-eye (*Scaturiginichthys vermeilipinnis*). *Fishes of Sahul. Journal of the Australia New Guinea Fishes Association* **6**, 282-284.
- Unmack, PJ, Wager, R (2007) Threatened Fishes of the World: *Chlamydogobius micropterus* Larson, 1995 (Gobiidae). *Environmental Biology of Fishes* **80**, 489-490.
- Wager, R (1995) Recovery Plan for Queensland Artesian Spring Fishes: 52. Qld Department of Primary Industries, Southern Fisheries Centre.
- Wager, RNE, Unmack, PJ (2004) Threatened Fishes of the World: *Scaturiginichthys vermeilipinnis* (Ivantsoff, Unmack, Saeed & Crowley 1991) (Pseudomugilidae). *Environmental Biology of Fishes* **70**, 330-330.

